WORLD METEOROLOGICAL ORGANIZATION

EVALUATING THE IMPACT OF AEROSOLS ON NUMERICAL WEATHER AND SUBSEASONAL PREDICTION

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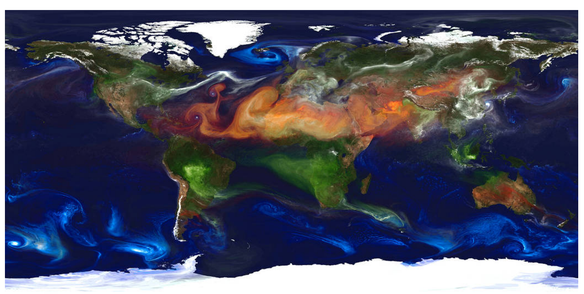
INTRODUCTION

The importance of atmospheric composition in Numerical Weather (NWP) and Climate Prediction (CP) has been addressed by many studies in the last few decades. Scientific research in the modelling field has been focused on better understanding atmospheric chemistry's role in the predictive skill of global and regional models, using climatologies or including real-time treatment of aerosols, for example, in operational forecasting systems or research models. Recognizing the role of atmospheric composition as a fundamental component to improve forecast capabilities, WGNE, jointly with the WWRP Subseasonal to Seasonal (S2S) Steering Group and the GAW Scientific Advisory Group (SAG) on Modelling Applications (SAG-APP), has been leading the second phase of the WGNE Aerosol project. The project aims to explore the importance of interactive aerosols in short to medium-range and subseasonal predictability. The project considers the participation of operational meteorological centres as well as research groups from institutions around the world, contributing with their state-of-the-art of integrated chemistry-meteorology numerical modelling. A set of experiments consisting of limited-area runs or sub-domains provided by global models, as well as subseasonal experiments including re-forecasts based on an ensemble approach on the global scale have been provided by modelling groups.

FIGURE 1

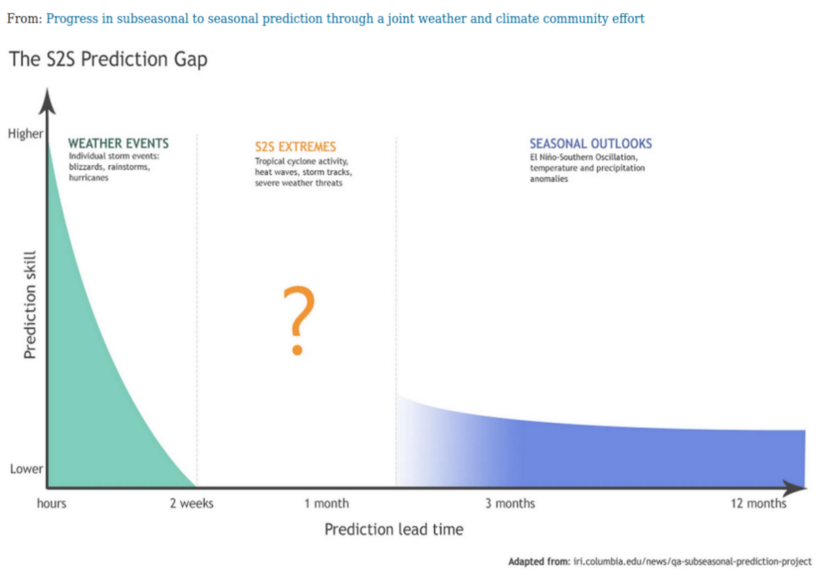


High-resolution global atmospheric modeling run of the NASA Center for Climate Simulation, Goddard Earth Observing System Model, Version 5 (GEOS-5). 10km Global aerosols simulation. Dust (red), sea salt (blue), smoke (green), and sulfate particles (white). Source: `https://www.nasa.gov/multimedia/imagegallery/image_feature_2393.html`

SUBSEAZONAL PREDICTION

Subseasonal prediction has been recognized in recent years because of its potential in providing useful and skillfull information for socioeconomic sectors of society. There is a recognized gap between Numerical Weather and Seasonzal Prediction that should be covered by the Subseasonal Prediction. Source: `https://www.nature.com/articles/s41612-018-0014-z`

FIGURE 2



MODELING CENTERS PARTICIPANTING

- China Meteorological Administration (CMA);
- Environment and Climate Change Canada (ECCC);
- European Centre for Medium-range Weather Forecasts (ECMWF)
- Institute for Astronomy, Astrophysics, Space Applications and Remote Sensing (IAASARS) of the National Observatory of Athens (NOA);
- Japan Meteorological Agency (JMA);
- National Institute for Space Research in Brazil (INPE);
- National Aeronautics and Space Administration (NASA);
- National Oceanic and Atmospheric Administration: Homepage (NOAA);
- Korea Meteorological Administration (KMA).

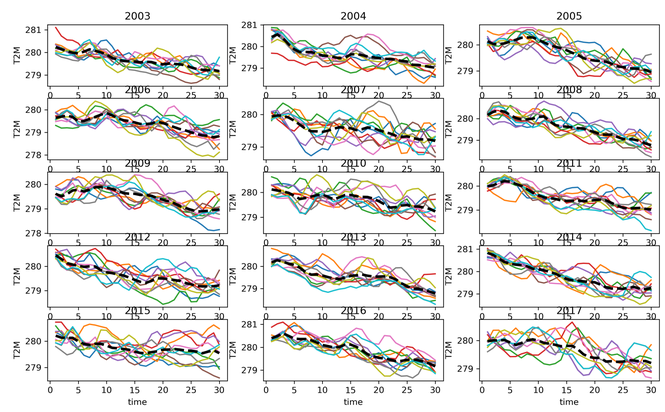
DATASETS AND EXPERIMENTS

Modeling datasets have been produced by modeling centres and sent to INPE (the project host). Daily data from the ERA5 reanalysis have been used to assess 2-meter air and 2-meter dewpoint temperature hindcasts quality.

Experiments:

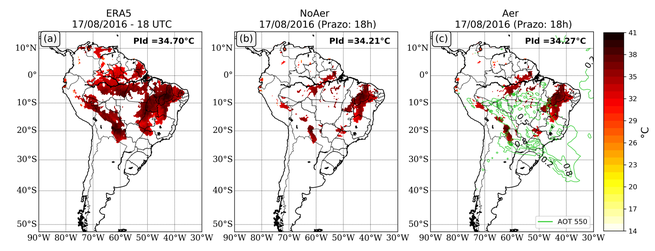
- INT: Modelling systems consider three-dimensional interactive chemistry–climate–aerosol model in their runs.
- NOINT: Modelling systems consider climatological or fixed aerosol loading.
- Global models: hindcasts (2003-2018/2019)
- Limite-area domains: Numerical Weather Forecasts for August-September-October 2016-2018/2019

FIGURE 3



Hindcasts: mean 2-meter temperature for the nine members of the ensemble of the NASA-GEOS-5 Global Model.

FIGURE 4



NWP experiment: ECMWF-IFS heatwave forecast considering the $experiment_{INT}$ and $experiment_{NOINT}$.

ACKNOWLEDGEMENTS

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